

5-24-2001

Perceived motion

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Rochester Institute of Technology

A Thesis Submitted to the Faculty of
The College of Imaging Arts and Sciences
In Candidacy for the Degree of
Master of Fine Arts

Perceived Motion

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May 24, 2001

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Thesis Statement

In the course of creating furniture for my thesis exhibition, I will draw on the fields of physics and geometry to inspire the forms and surfaces that I create. My interest in perpetual motion, although unattainable, has prompted me to experiment with the effects of implied, perceived and kinetic motion. Within this exploration, I wish to exemplify my own interpretation of motion by sampling some of the possibilities that these categories hold and integrating them into a body of work. For example, in close relation with M.C. Escher's work, my work will allude to motion by using tessellations that create a visual pattern of movement. I will approach this group of topics in a similar way, with the intent of achieving a dialogue with viewers by conveying a varied sense of motion collectively within the work.

Basic Premise

While motion is normally associated with the actual movement of an object, I would like to borrow this word to describe how a person's eye travels while viewing the patterning in my work. Throughout my furniture these forms will manifest themselves in a variety of ways conveying a sense of perceived motion.

Goals and Objectives

My goal in pursuing this topic is to use repetitive patterning as a vehicle for a perception of movement on the surfaces of my furniture. The patterns themselves may be two dimensional or may be sculpted into a third dimension.

My original idea of perceived motion as the subject of my thesis came about as a result of my interest in M.C. Escher's wood engravings and lithographs.

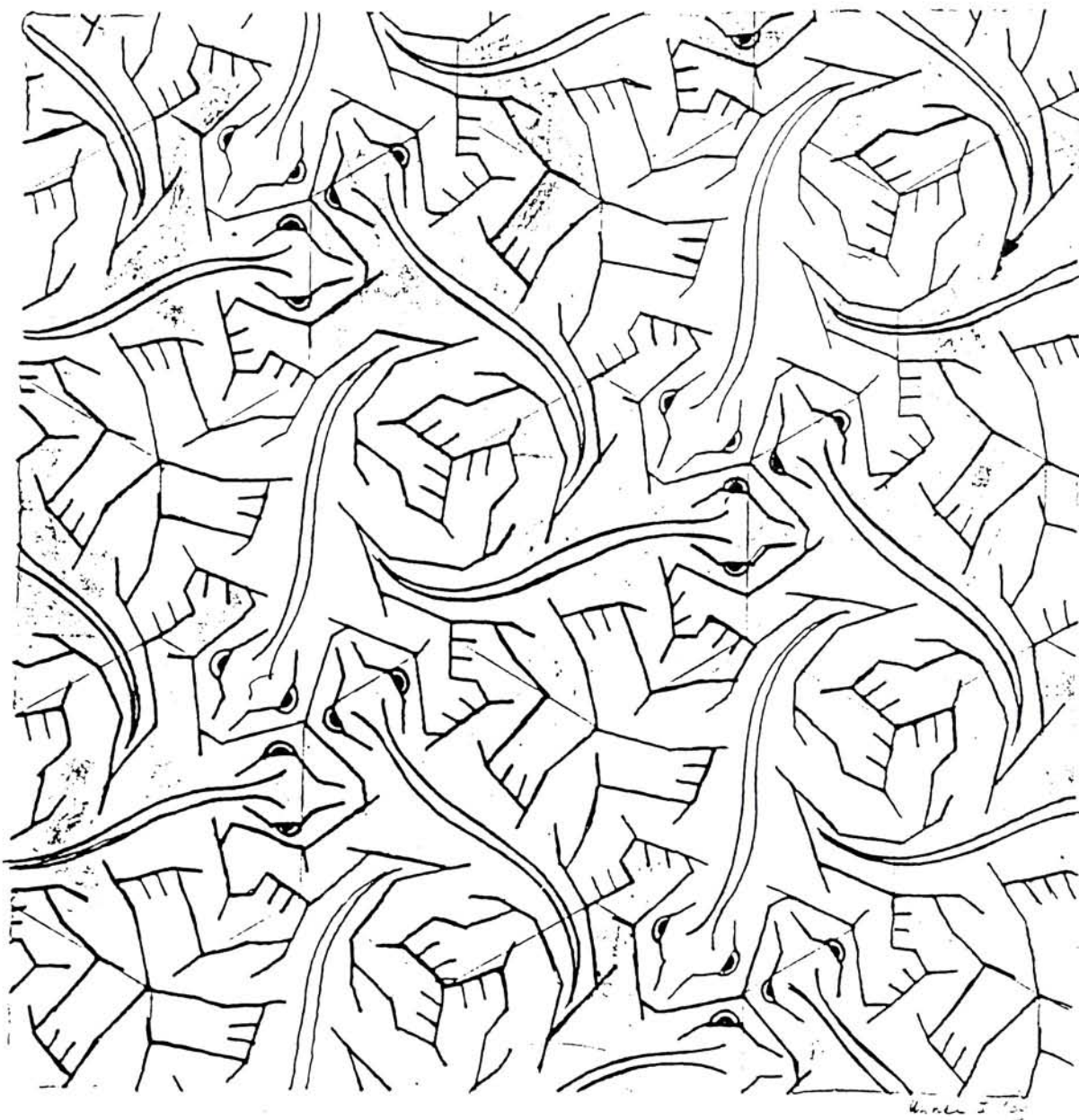
Prior to 1937, Escher's work dealt primarily with his portrayal of the visible world.

His ability to distort this world is evident in the images he created by incorporating a combination of angles of view within the same space.

After studying Moorish mosaics in 1936, Escher turned his attention to the use of double contours. These mosaics are comprised of regular repetitions of basic geometric shapes that can continue infinitely. Around this same time his half brother, B.C. Escher, a professor of geology at the University of Leiden pointed out to him the similarities between crystallography (the study of the geometric structure of crystalline solids), and his geometric figures.

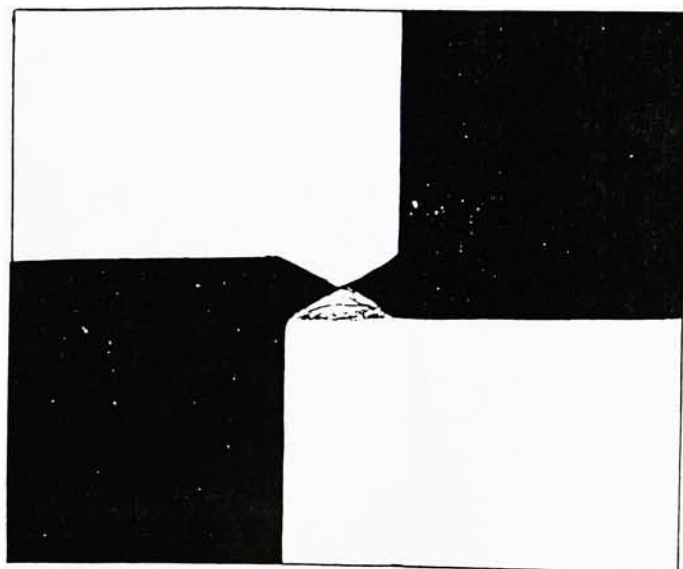
Using his copies of Moorish mosaics and having done some reading on crystallography, Escher began to construct contiguous, repeated forms of his own. Working from the abstract geometric figures taken from the Moorish mosaics and the crystalline formations, Escher developed figures that when linked in contiguous symmetrical series, could be repeated to infinity. He tried to bring the abstract patterns to life by substituting or superimposing them with animals, plants and people. Ironically, these depictions were contrary to Moorish religion.

After learning about and looking at M.C. Escher's work, I became interested in using this method of repeating patterns to embellish the surfaces of the furniture I create. Now using this system, I take into account the figure of the wood and the angle at which the wood grain intersects with itself at the seams were the shapes fit together to create my own patterns.

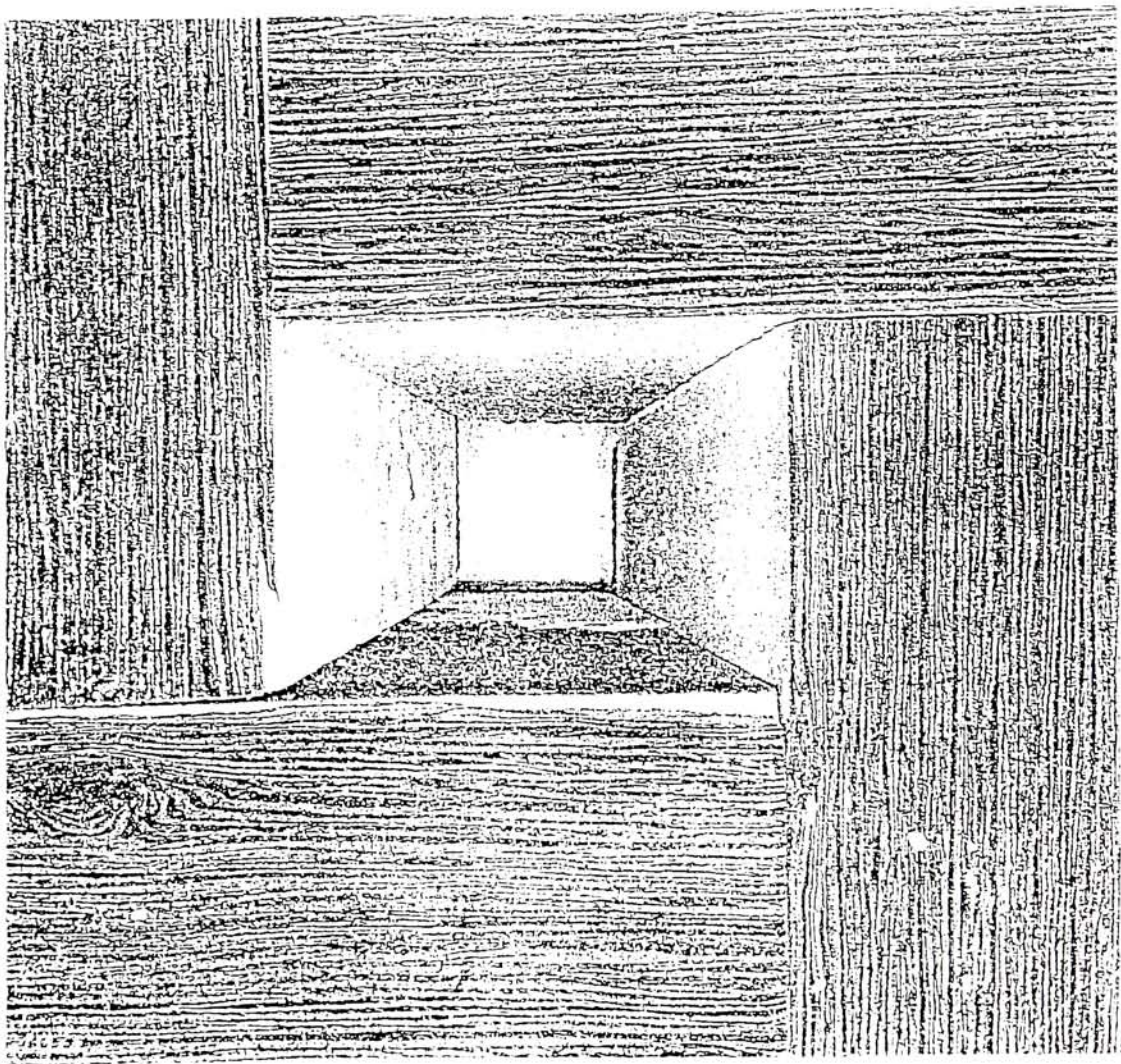


M.C. Escher
Reptiles, 1943
Lithograph (13 1/8 x 15 1/4)
Signed and dated III-'43 MCE

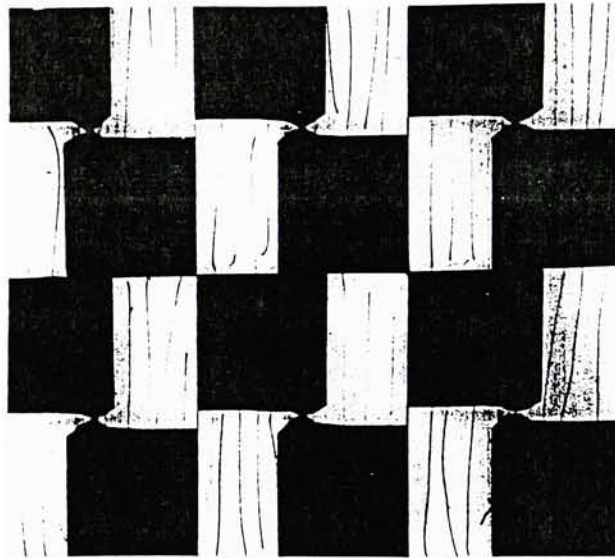
When I first learned of perpetual motion, I was intrigued by the idea of something that has existed since the beginning of time and continues to go on forever. This subject caused me to think about the propagation of the human race, animals and plants alike. Fascinated by the magic that occurs when cells divide and then multiply, and their resulting cell structure, I then thought of how cells are formed and the shapes they create. From there I became interested in repeating patterns. In particular, patterns that are solely comprised of one shape that repeats itself in multiple directions and continues to do so infinitely. These are termed tessellations. As defined in the book Symmetries of Culture, "tessellations are designs that must consist of regularly repeated patterns. That is, they must be designs with parts moved by rigid geometric motions." In my body of work, the first of these tessellations, in this case consider them tiles, are comprised of four identical pieces. They are arranged in such a manner that two sides of each of the four pieces are parallel to the neighboring piece. That is to say, where there is a 45-degree bevel on one piece, another piece rests parallel to it on that adjoining side, and the face beside it is also parallel to its neighboring piece, only the angle now is 30-degrees. (see fig. 1)



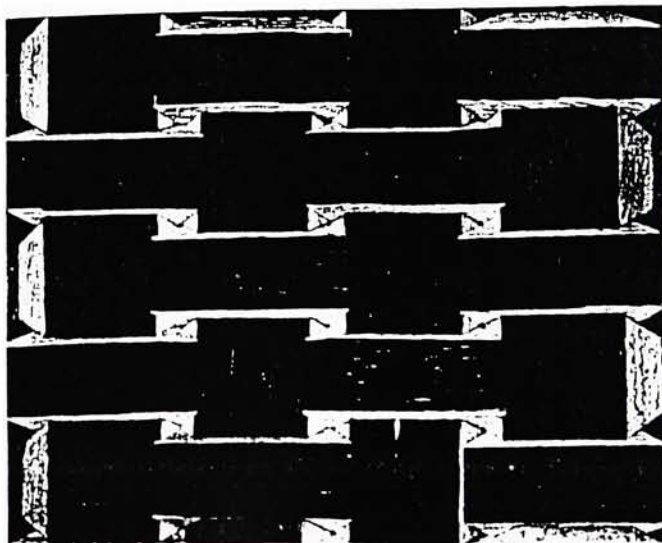
Much to my surprise, when these pieces were assembled, the resulting shape was an inverted pyramid that occurred on both sides of the new tile. After further investigation, I discovered that by sliding the pieces away from themselves I could create a different result where the pieces converged, taking on the form of a compound inner frame comprised of two beveled edges, one 45-degrees, the other 30-degrees. (see fig. 2)



After this experiment, I concluded that the four pieces that created a unit, visually worked to my satisfaction on their own, but did not merge with each other well when grouped with additional units of the same kind. (see fig. 3)

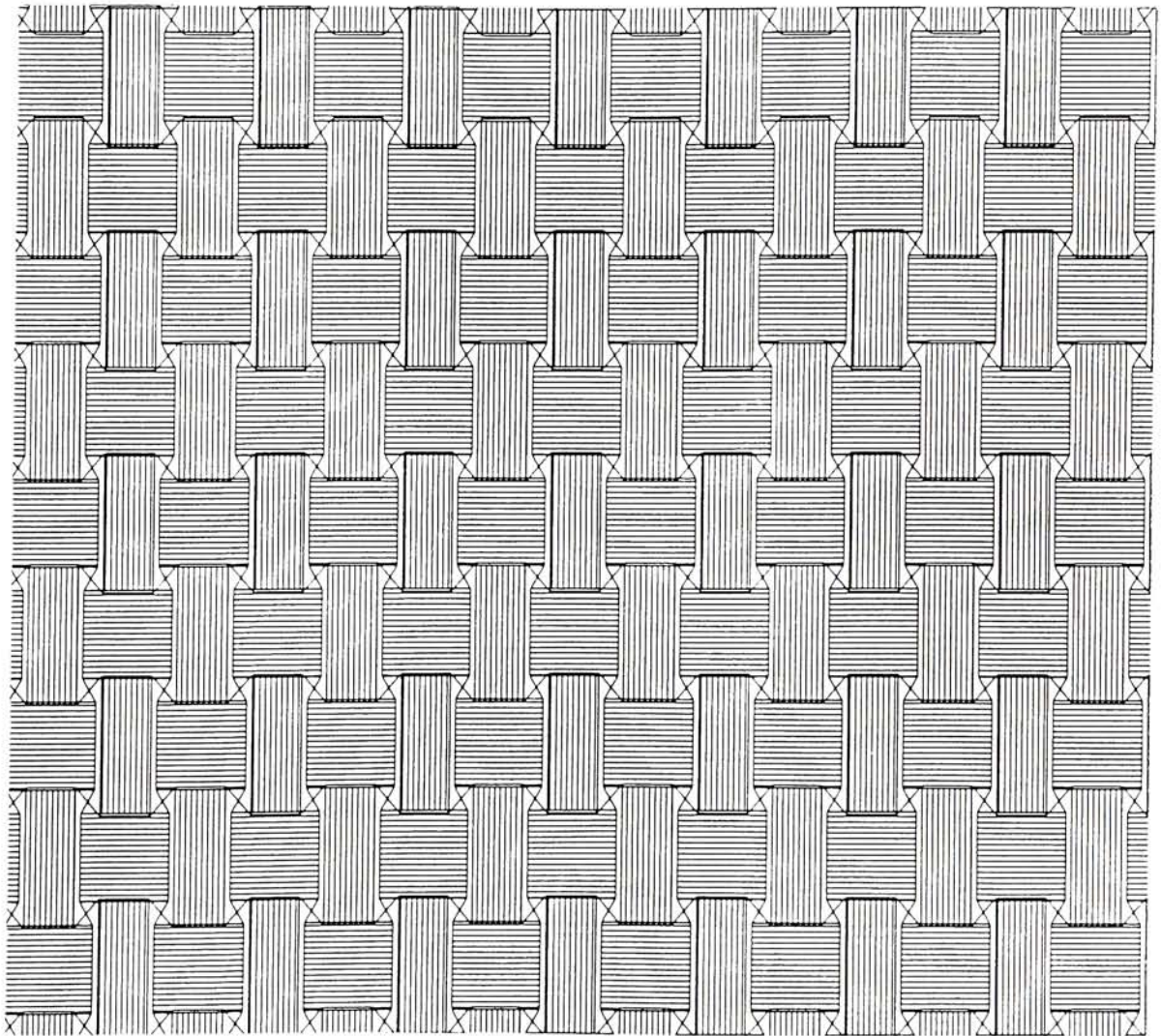


This abrupt pattern, I thought, could be remedied by including angles on all four sides of the tiles. Using this idea I created a homogenous composition where, to my delight, an inverted pyramid, which I will now refer to as a vertex, was created at each intersection. (see fig. 4)



It was at this point that I achieved my goal of producing a repeating pattern comprised of a single shaped piece that when interlocked with pieces identical to it created a tessellating surface. To explain, identical pieces were placed next to each other; every other one was flipped over, which produced an infinite pattern in four lateral directions.

(see fig. 5)

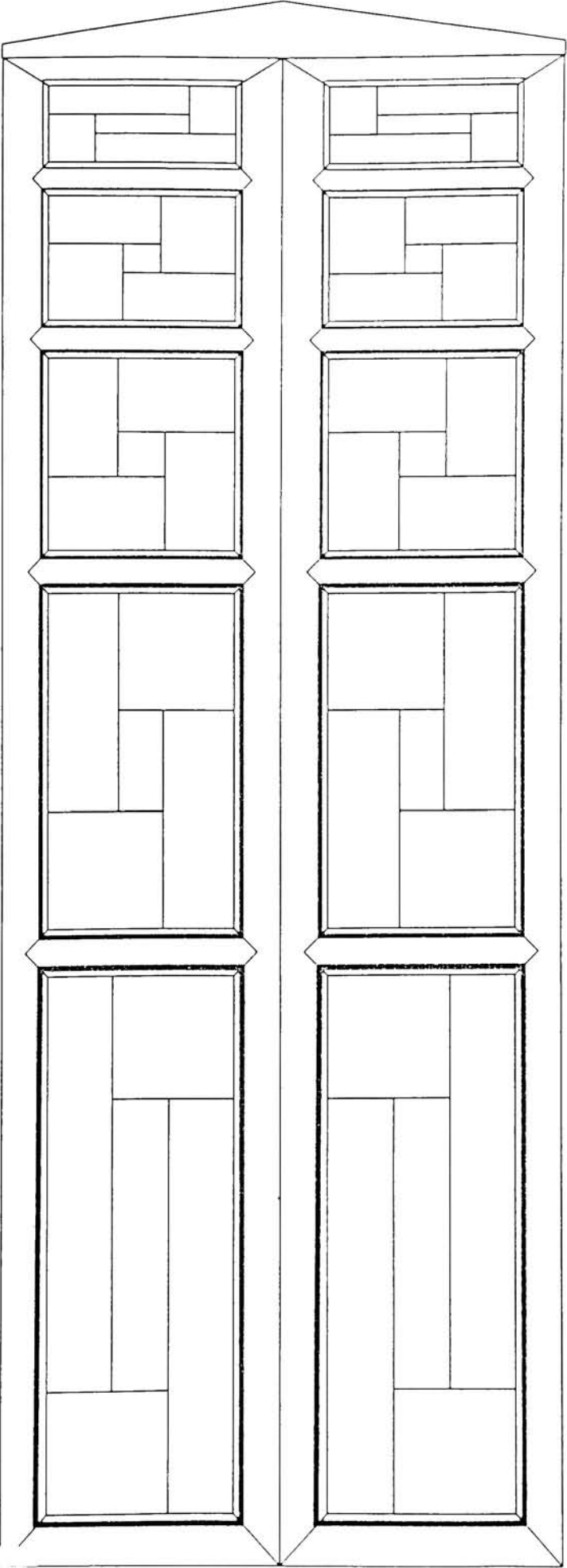


This discovery led me to the idea of creating a functional surface that would be covered with tessellating shapes. This would take the form of a coffee table. The idea was to manufacture three hundred or so tiles that were exactly alike in every dimension. Because I wanted a perfect intersection, that is vertex, wherever any four tiles met, I thought it would be wise to use an inert material such as MDF (Medium Density Fiber) which would not expand and contract and thus would insure me a more precise union than solid wood could offer me. I laminated quarter sawn wood veneers to the top and edges of the tiles: wenge on the top and red oak on the edges. When placed together the tiles took on a dynamic appearance creating different patterns as a whole and individually. The intersecting grain in the wood really helped defined the overall design.

The only draw back was that while in the process of gluing veneer to the MDF tiles, I added to the discrepancy in the dimensions of each tile, which resulted in cumulative error at each intersection. Because the tiles needed to be absolutely identical in all dimensions and angles, I could not achieve a perfect vertex at each intersection, which defeated my original idea. I however, decide to minimize the possibility for error by decreasing the number of tiles used down to four. Using these tiles as my primary design element, gave me an idea for the facade of an armoire.

I looked to the world of mathematics for inspiration and came across a medieval discoverer, Leonardo Fibonnaci da Pisa. Fibonnaci is credited with discovering a certain mathematical sequence. The Fibonnaci sequence is produced by starting with 1 and adding the last two numbers to arrive at the next: 1,1,2,3,5,8,13,21,34, etc. I made use of the sequence to inform the evolution in size for each door panel in order to obtain the rough height of the cabinet. In order to complement the continuance in panel length, I also increased the width of the door rails as well as that of the inlaid wenge frames as they descend from the top of the armoire. In support of my thesis, I aimed to use these tiles as a way of conveying a sense of “perceived motion” by using an effect that is similar to the way an aperture works inside of a camera. Giving the viewer the sense of convergence in the panels’ decreasing centers as well as an optical sense of diminishing perspective as one’s eye travels from the bottom of the doors to the top. (see fig. 6)

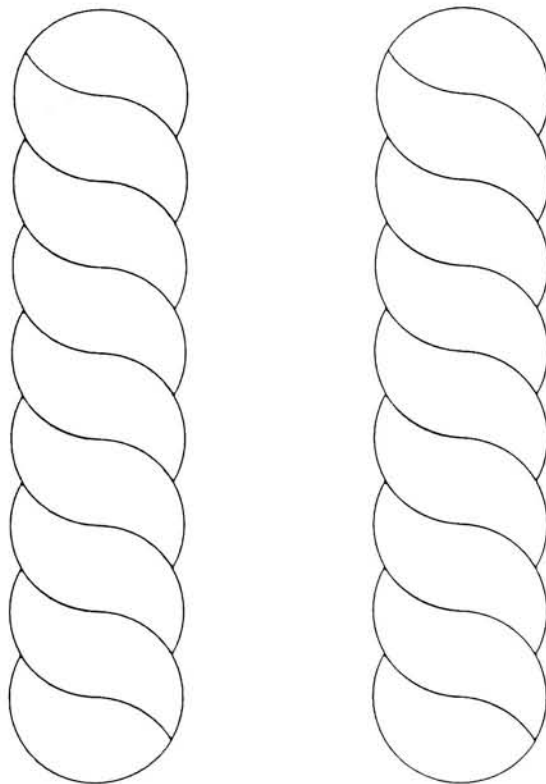
Figure 6



Having done straight lines, I now wanted to experiment with curves. I wanted to achieve a similar result with circles as I did with the rectangular tiles. I found that because circles can only touch each other tangentially, that it was going to be difficult to produce any sort of repetition, short of distorting them so that they would fit into each other. However, by overlapping the circles in a straight line, I discovered secondary shapes that, in my mind, conjured a sense of twisting similar to the strands of a rope. Unlike the previous tiles, these shapes tessellated in one direction only, and could be terminated with a section of the original circle to create a finite composition.

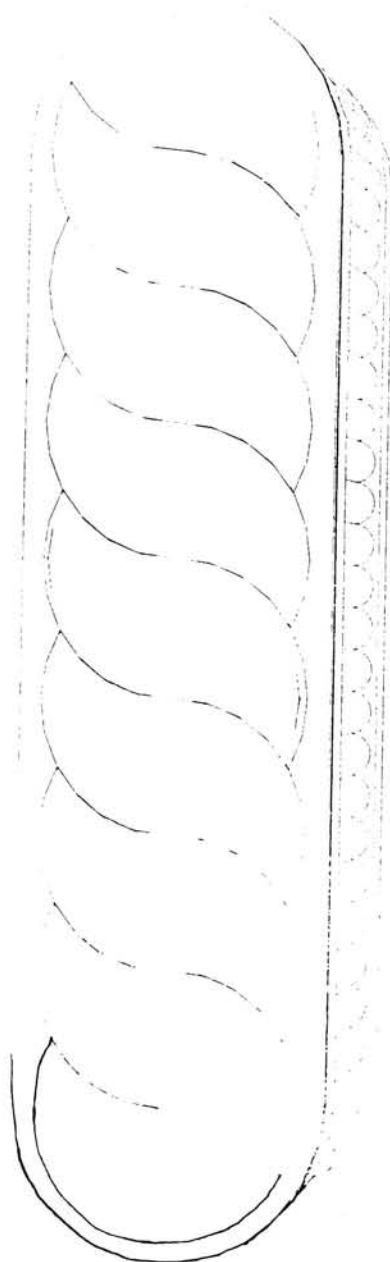
(see fig. 7)

Continuous arcs of tangential circles



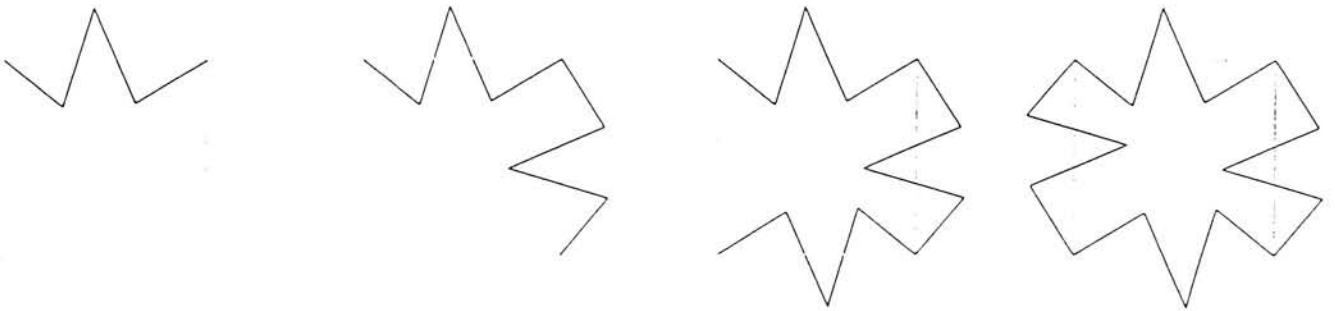
This twisted appearance became even more apparent when I shaped the mahogany sections used to create the stylized "rope door" of my wine cabinet. (see fig. 8)

In addition to the twisting movement found in the door, I attempted to create a sense of rhythmic motion by creating a profile around the perimeter of the cabinet that loosely gave semblance to the contour of the mahogany shapes. Together these shapes created a soft-modeled surface that was very inviting to touch. Having now catered to the sense of touch, I started thinking of ways to lure the eye of an observer by creating patterns within patterns.

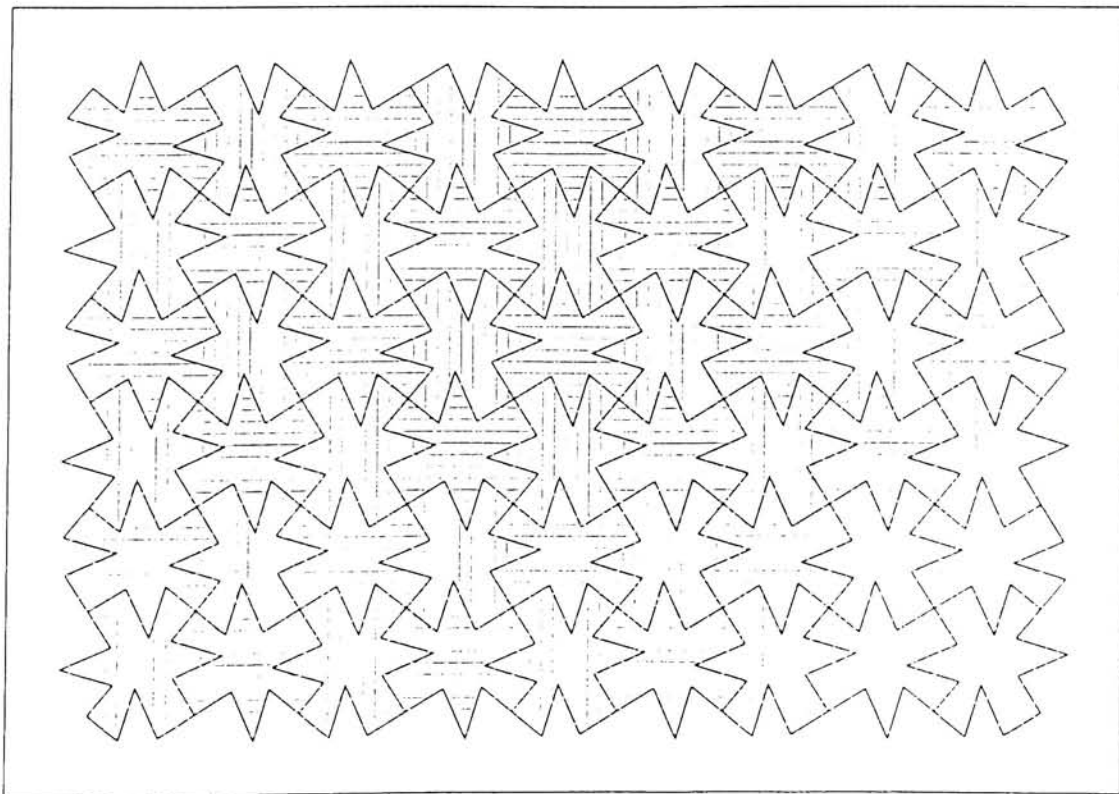


These patterns took the shape of two-dimensional tessellations. My goal was to create a vibrant surface that would capture attention by giving the impression of the third dimension. I went about this by creating a single piece; call it a matrix element. This piece fit into itself on all four sides. This was accomplished by taking a square, drawing a zig-zag line along one side, and then rotating this line around the remaining three sides. The ensuing shape is now a tessellation that repeats infinitely in any given direction. (see fig. 9)

Rotation of one side of a square



I find this concept very exciting because it conveys the idea of perpetual motion. Originally, I simply believed that the alignment of these pieces when placed together would give the illusion of depth. However, the linear grain pattern in the quarter-sawn padauk, and the way it was oriented within the pieces, resulted in something that I did not expect. Since every piece is connected to the other at right angles, concentric frames are produced at each intersection. Some look like they recede; others give the appearance of pyramids. The surface of the coffee table resonates with activity. Instead of trying to capture this movement by creating a frame around the composition, I chose to create a field of curly maple "behind" it so that the padauk pieces could spill over. I then tried to correlate the negative space of the apron and legs to imitate the profile of one of the pieces. (see fig. 10)



After demonstrating various ways of conveying perceived motion, I would like to experiment some more, by simply changing or alternating wood species and varying grain direction to produce different visual effects. I believe that I have just tapped into some possibilities, and in the future, plan to further explore more manifestations of this theme. Through this topic, I have come to learn of similar areas of study such as Crystallography¹, Euclidean transformations² and Automata³. Although these fields require a great amount of mathematical understanding, which I admittedly do not possess, they still intrigue me because they share a common interest in themes that deal with perpetuity. Having just completed a small body of work for my Thesis Exhibition, I feel that this sort of investigation has given me the type of material needed to ensure continuity in my work. I now look forward to investigating these other concepts to see what other ideas might come from them.

¹ Branch of science that deals with discerning the arrangement and bonding of atoms in crystalline solids and with the geometric structure of crystal lattices.

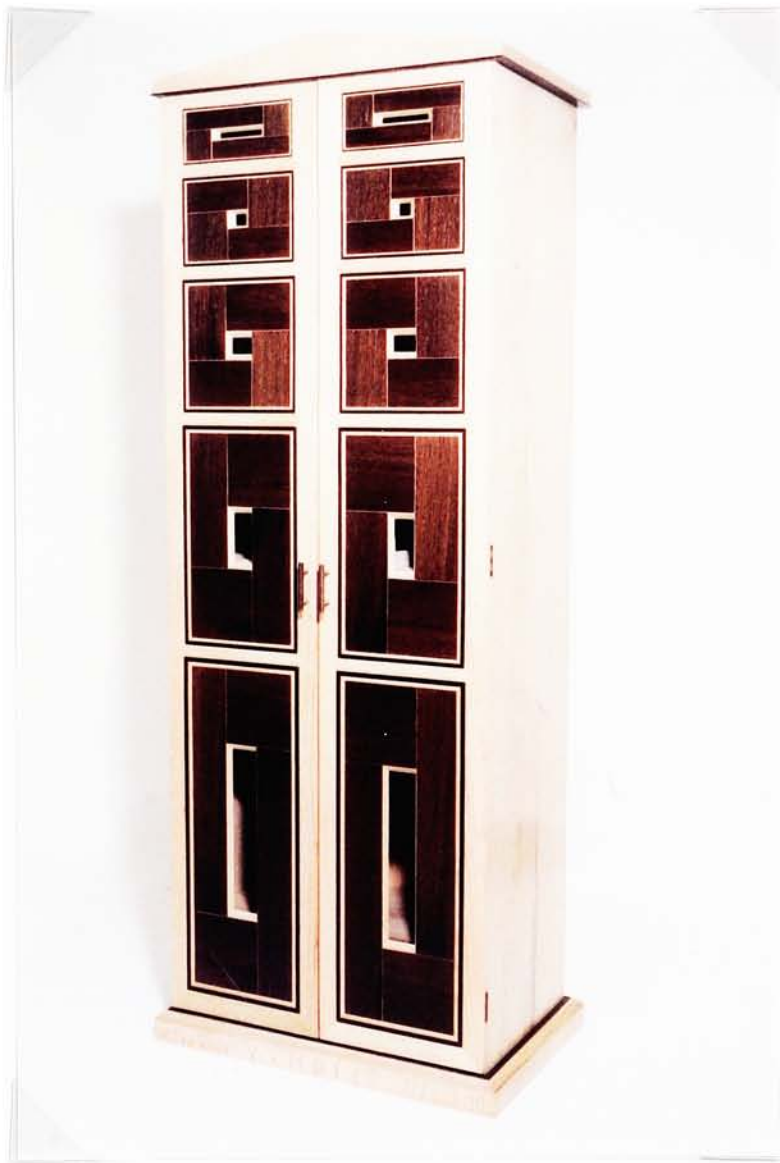
² The study of complex shapes with the property of self-similarity. A self-similar object's component parts resemble the whole, so that each part, and each of its parts, when magnified, looks roughly like the whole object.

³ Body of physical and logical principles underlying the operation of any electromechanical device that converts information input in one form to another, or into some action, according to an algorithm.

In regards to the thesis work itself, I have come to the conclusion that some pieces supported the thesis better than others did. I feel that the armoire was very conservative in the amount of indication it gave to motion. Partly because the idea for the doors was filtered through my inability to produce the identical exact pieces that I needed in order to produce a three-dimensional tessellating surface. I do however, feel that this was a worthwhile point of departure and gave me a valuable direction to go in.

I think that the wine cabinet worked well to communicate a sense of motion, both twisting and rhythmic. Its rhythmic contour also gave an indication as to what the contents of the cabinet might be. It did however, fail to fulfil my initial level of interest in perpetual motion, in that the shapes for the doors only tessellated in one direction and made use of "terminators" that were not the same shape as the other pieces that did tessellate.

Finally, and most prominently, the top surface of the coffee table best illustrates my initial intent in taking on this Thesis Proposal. I relied on repetitive patterning to create a sense of motion, and came to discover additional ways of expressing this idea. The intersecting grain on the surface of the coffee table, and the lively patterns it created, was unexpected, but a very welcomed visual effect. I would like continue working with tessellations, by creating graphic images on the surfaces of furniture that compliment its three-dimensional design. In other words, I seek to use the form of the furniture to inform the appearance of its surface.



Convergence

Red Oak and Wenge Veneer

85" x 33" x 21"



Bacchus

Ash and Mahogany

68" x 18" x 18"



Autumn Floor

Padauk, Curly Maple, and Wenge

45" x 32" x 17"

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